Information Item: A review of environmental impacts from high speed boats on Indiana's public freshwater lakes; Administrative Cause No. 10-029V

A Review of Environmental Impacts from High Speed Boats on Indiana's natural lakes

Background

This document provides an overview of environmental impacts from high speed boats on Indiana's public freshwater lakes.

The number of recreational boats (registered and non-registered) has more than tripled over the past 35 years (NMMA.org, as cited in Beachler and Hill, 2003). As of 2010, there were over 281,000 registered recreational boats in Indiana, up 5% from the year before and up 29% since 2001 (NMMA, 2011).

The majority of boats operated in 2011 were between 15-18 ft long (37%). Boats 19-21 ft long were second at 21% and were just more than boats 10-14ft long (16%). Also, the majority of boats operated in 2011 were propelled by outboard engine (59%) when compared to all other means of power (RBFF, 2012).

Environmental Impacts

Boats can impact near-shore environments through both direct and indirect means. Hill (2004) classifies disturbances into the general categories of noise pollution, fuel emissions, and physical impacts such as wake-induced shoreline erosion and prop-wash induced sediment scouring and resuspension. Physical impacts due to wake and wave action are dependent upon numerous variables such as boat size, boating speed, hull design, water depth, and shoreline characteristics. Hill (2004) states:

> *"From an impact point of view, a number of questions need to be asked and answered. The most important question is whether or not boating activity at a particular location has the ability to generate waves of a height sufficient to dislodge sediment at the shoreline. This question needs to be answered in two steps. First of all, the height required to dislodge sediment will be a strong function of the characteristics of the bank. Is the soil well-consolidated, with woody debris providing a sheltering effect, or is the soil sandy and cohesionless, with no protective vegetation? A bank exhibiting the former characteristics will be able to withstand larger loadings than the latter. A universal criterion does not exist and site-specific studies are desirable"*

As pointed out by Hill (2004), local shoreline characteristics play a significant role in determining nearshore impacts from boating. However, once shoreline characteristics have been observed and site-specific information has been obtained, one can more easily assess whether boats in that area will have significant impacts as a result of wake or wave action. Hill (2004) noted that wakes generated by a boat are complex functions and include parameters of boat speed and water depth, as well as hull design and length.

Wake or wave action is dependent on numerous variables; however boat speed, boat size, draft, and distance from shore have been shown to strongly correlate to potential shoreline erosion if conditions for erosion are favorable.

Hill (2004) concludes that, due to overwhelming variability in boats, their typical use patterns, local weather conditions, and physical lake parameters such as bathymetry and sediment size, specific conclusions are difficult to reach when generalizing impacts from boat wakes. Nevertheless, general trends, such as wake height decreasing with distance from the boat, and erosive potential of wash decreasing with water depth, were noted. Though Hill (2004) generally focused on shore or bank erosion in relation to wave height, various other ecological impacts may be caused by recreational boating, such as the decrease in water clarity, degradation of water quality, and direct and indirect harm to aquatic vegetation, fish, and wildlife (Asplund 2000).

Furthermore, these impacts are not limited to wave or wake action along shore, but may also be the result of exhaust emissions, propeller or hull contact with the lake bottom, turbulence within the water column, noise generated by boats, and the physical movement of the boats themselves (Asplund 2000). Figure 1 shows how each of these mechanisms impact aquatic ecosystems and the effects they can have on the aquatic environment. As the number of boats and boating participants increase, it is likely that these ecological impacts will increase accordingly.

Mechanism: / *Effect:*	**Emissions and exhaust**	**Propeller or hull contact**	**Turbulence**	**Waves and wake**	**Noise**	**Movement**
Water Clarity (turbidity, nutrients, algae)		■	■	■		
Water Quality (metals, hydrocarbons, other pollutants)	■					
Shoreline Erosion				■		
Macrophytes (plant communities)		■	■	■		
Fish	■	■	■			■
Wildlife (Birds, mammals, frogs, turtles)		■		■	■	■
Human enjoyment (air quality, peace and quiet, safety, crowding)	■			■	■	■

Figure 1. Potential mechanisms by which boats impact aquatic ecosystems and the effects that they can have on the aquatic environment, as found in Asplund, 2000. Shaded areas indicate where a "Mechanism" has an "Effect."

Asplund (2000) concluded that the effects of boats on aquatic systems are complex and depend on a number of factors; however, a few general observations were made. First, the physical impacts of propeller, waves, and turbulence appear to be more of an issue than engine fuel discharge. Water clarity, aquatic plant disturbance, and shoreline erosion all are serious issues that can be exacerbated by boat traffic. Second, most of the impacts of boats are felt most directly in shallow waters (less than 10 feet deep) and along the shoreline of lakes and rivers not exposed to high winds (less than 1000 feet of open water). Third, these effects may have repercussions for other features of the aquatic ecosystem, including the fish community, wildlife use, and nutrient status. These observations all emphasize that the most important area of a lake or river to protect is the shallow, near-shore habitat known as the littoral zone. This zone is often characterized as the depths at which aquatic vegetation can grow and is typically dependent on water clarity and quality. On most lakes, this depth is ten (10) feet or less and is usually where boating impacts are

felt most directly. Boats that operate in deep waters with large surface areas are not likely to be impacting the aquatic ecosystem.

Generally, assessing impacts caused by recreational boating is dependent on numerous factors and complex physical mechanisms. With an increase in the number of recreational boaters, these complex mechanisms are also likely to increase in severity.

Current Boating Laws

The State of Indiana already employs numerous boating regulations to limit nearshore impacts on natural lakes. Boating is restricted to idle speed within 200 feet from shore on all public freshwater lakes, and boating in this area is limited to ingress/egress or trolling (IC 14-15-3-17). Additionally, boat operation on lakes under 300 acres, which are likely more susceptible to boating impacts, is limited to 10 miles per hour unless an exemption is approved by the Natural Resource Commission. On select lakes, this has been modified to allow for 3-4 hours of high-speed boating during the day. However, these cases are reviewed on an individual basis and ecological impacts are assessed for each lake by law enforcement and fish and wildlife staff during the review.

In order to further protect ecologically sensitive areas, special boating zones have been established under 312 IAC 5-6-1. These 'ecozones' are established for fish, wildlife, or botanical resource management and limit boating to idle speed or to non-motoring operation within specific, buoyed areas. To date, ecozones have been established on Lake Wawasee, Lake Tippecanoe, Little James Lake (Tippecanoe Chain), Dewart Lake, and Lake Manitou.

Though not formally classified as ecozones, boating has also been restricted to idle speed within shallow areas of numerous lakes to minimize the resuspension of sediment. Often, these areas are within in-lake channels surrounded by wetland vegetation. However, these areas may also have unique hazards or conditions and are needed to protect lake users. Also identified in 312 IAC 5-6, lakes with these specific restricted areas include the Barbee Chain of Lakes, Bass Lake, Lake James Chain of Lakes, Lake of the Woods (Marshall County), Lime Lake, the Oliver Chain of Lakes, and the West Chain of Lakes.

Conclusion

The environmental impacts of boats on public freshwater lakes is a complex process that is dependent upon a variety of factors. While more boats of a larger size may now be used on Indiana's public freshwater lakes, the impacts are not necessarily greater, except near the shoreline and particularly in the littoral zone. If additional restrictions are needed, rule language would be needed to establish special boating zones in 312 IAC 5-6.

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